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SMART GATE DESIGN AND SHIP TICKETING WITH ANDROID APPLICATION

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ABSTRAK

Gerbang otomatis merupakan pengembangan dari dunia digital yang bertujuan untuk memudahkan kehidupan penghuni dan mengurangi kesalahan yang dilakukan oleh manusia. Otomasi dibuat untuk menghubungkan manusia dengan teknologi agar dapat maju dan berkembang. Secara umum, gerbang berfungsi sebagai mekanisme keamanan. Untuk memudahkan pekerjaan manusia, teknologi automatic gate system diharapkan dapat mengurangi pekerjaan manusia, misalnya saat satpam membuka pintu gerbang. Teknologi yang ditawarkan dalam makalah ini merupakan kombinasi antara sistem gerbang otomatis dan sensor dengan aplikasi ticketing di pelabuhan perintis. Sistem ini diharapkan mampu memudahkan pekerjaan manusia dengan bantuan smartphone saat menggunakan transportasi laut di pelabuhan perintis yang beroperasi secara otomatis. Hal utama yang akan dibahas dalam tulisan ini adalah desain gerbang untuk penumpang. Hasil yang didapatkan adalah gerbang otomatis yang terhubung dengan sistem ticketing baik berbasis web maupun mobile.
Kata kunci: Gerbang otomatis, smart gate, sistem tiket, berbasis web, mobile.

Kata kunci: *automatic gate*, *smart gate*, sistem *ticketing*, berbasis web, dan mobile.

ABSTRACT

Automatic gate is a development of the digital world that aims to facilitate the lives of residents and reduce errors made by humans. Automation is made to connect humans with technology so that they can advance and develop. In general, the gate serves as a security mechanism. To facilitate human work, the automatic gate system technology is expected to be able to reduce human work, for example when a security guard opens a gate. The technology offered in this paper is a combination of automatic gate systems and sensors with ticketing applications at pioneer ports. This system is expected to be able to facilitate human work with the help of smartphones when using sea transportation at pioneer ports that operate automatically. The main thing that will be discussed in this paper is the gate design for the passenger. The result obtained is an automatic gate that is connected to the ticketing system, both web-based and mobile.

Keywords: *automatic gate, smart gate, ticketing system, web-based, and mobile.*

1. INTRODUCTION

As the largest archipelagic country in the world, sea transportation is an alternative means of inter-island transportation in Indonesia. The ease and smoothness of the transportation system is expected to be able to increase the level of equity in the economy in the Indonesian archipelago. As a marine transportation provider, pioneer ships are still constrained by the lack of passengers and the ticketing system that is not yet integrated. BPS noted that ship visits at Indonesian ports in 2019 reached 895.53,000 units, an increase of 10.97 percent compared to 2018 [1]. From the above background, we are interested in offering an automatic gate design at the pioneer port that is able to reduce the difficulties for both passengers and sea transportation managers with the help of an integrated digital system. This gate will be connected to a smartphone using a ticketing application

when a passenger orders a ticket, it will be directly recorded and can be used as a port entrance ticket by scanning a barcode.

Smart gate designs with digital systems have been widely developed, some of which are used for security and comfort in homes. A gate can be defined as a barrier door that is used to close and open a wall or fence. Meanwhile, an automatic gate system can be defined as an integrated gate with electronic components such as proximity sensors and actuators with the aim of reducing human effort in opening and closing the gate [2]. Smart gate control using Android application with wireless connection system makes gate access more convenient and fast by using device remote control [3]. The mobile application not only makes work easier but is also suitable for the market because it requires less manual work by maximizing smart work [4]. A 2.45 GHz wireless IC card system has also been developed for automatic gate systems at non-contact train stations. The system consists of a transmitter and receiver as well as a wireless IC card [5]. The development of projects using various types of technology such as infrared technology, radio frequency and many others has often been carried out, including wireless technology that can support several forms of long-distance data transfer. Sensing and control using Bluetooth, Wi-Fi, RFID, and cellular networks have started to be used for automatic gates in smart homes [6][7].

2. METHODOLOGY

2.1 *Smart gate design concept*

The Smart Gate concept that we built is based on a case study at the pioneer port on the process of entering passengers at the departure terminal. The dimensions and design of the smart gate are adjusted to the posture and volume of goods allowed to enter through the departure gate. The smart gate design is made with the help of software with stages such as shown in the Figure 1 and the electrical system is shown in Figure 2:

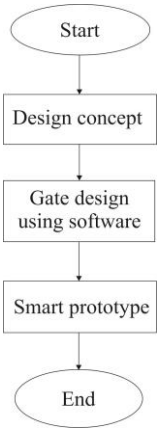


Figure 1. Gate design flowchart

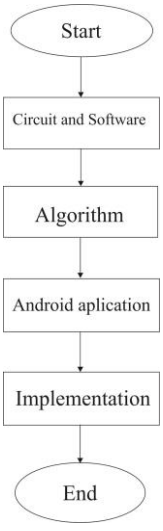


Figure 2. Electrical flowchart

Detailed drawings of the smart gate prototype made with the help of software. The door design chosen is a swing door system with a motion system using a DC motor. The rotary motion of the DC motor is 1800, with a delay time determined by the sensor after passengers enter. The gate material used is acrylic glass because it is strong and easy to shape, with a rust-resistant stainless-steel frame. Detailed drawing of the smart gate design as shown in Figure 3 with dimensions in millimeters. The total dimensions of this smart gate frame are 1200 mm x 200 mm with a total height of 985 mm. The dimensions of the acrylic glass door are 562 mm x 478 mm.

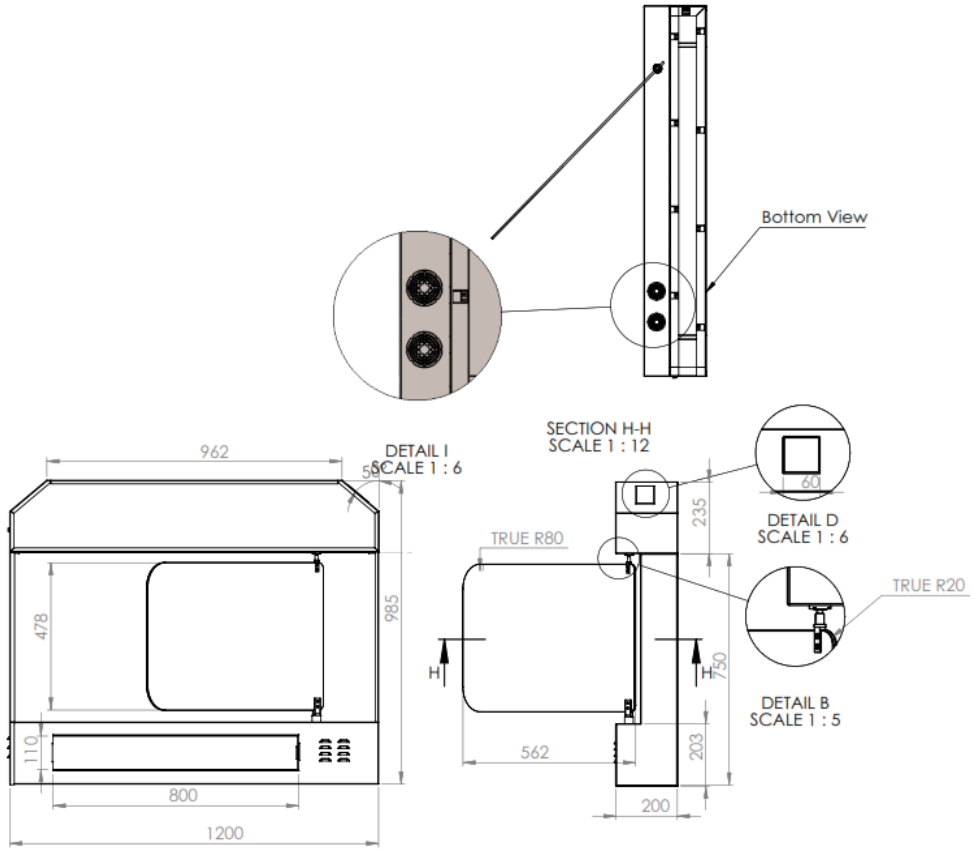


Figure 3. Smart gate design dimension

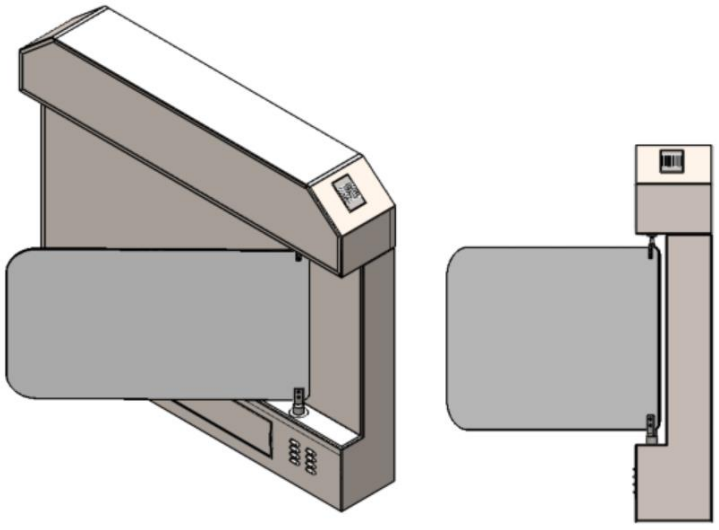


Figure 4. 3D Smart gate design

2.2 Electrical System

Main procedure of smart gate is started from passenger's data taken through QR Code Scanner, and then followed by analyzation of QR Code data using specific device, and in this case, we use raspberry. This step determined whether data valid or not, if data valid then gate is open and passenger could continue entering passenger waiting room, and if data not valid then gate is still closed. The general procedure of smart gate is as show in Figure 5.

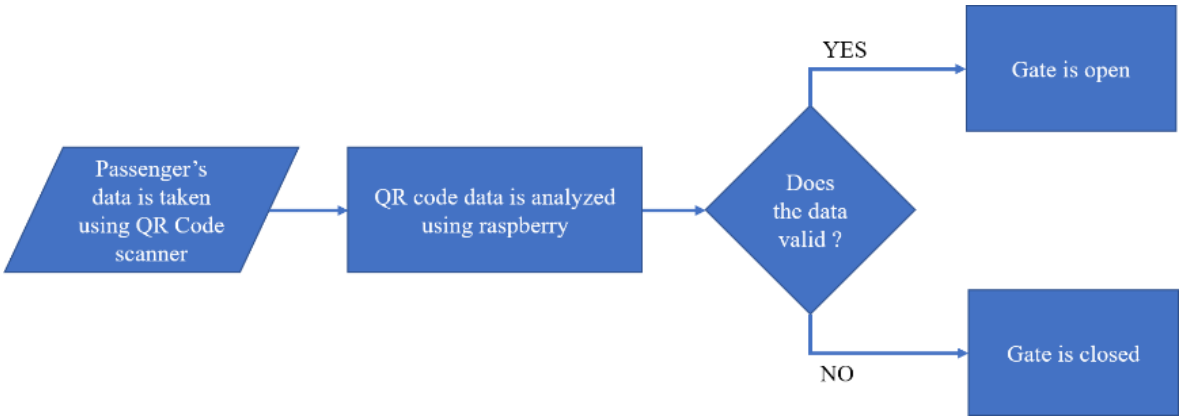


Figure 5. The general procedure of smart gate

Some devices are used to support our smart gate system, which are: an Access Point, a Server, a Barcode Scanner, a Raspberry Pi 4, a Driver Motor 43A BTS7960, and a Motor DC PG28. Barcode Scanner is connected with Raspberry Pi using USB, while Driver Motor and Motor DC connected to Raspberry using GPIO port. Barcode Scanner will provide passengers data and then sent them to raspberry, while raspberry will decide if the data valid or not by checking them through cloud database server accessed via Access Point. When the data is proved to be valid, then the gate is open, otherwise the gate is not open. The complete design of electrical system is shown in Figure 6.

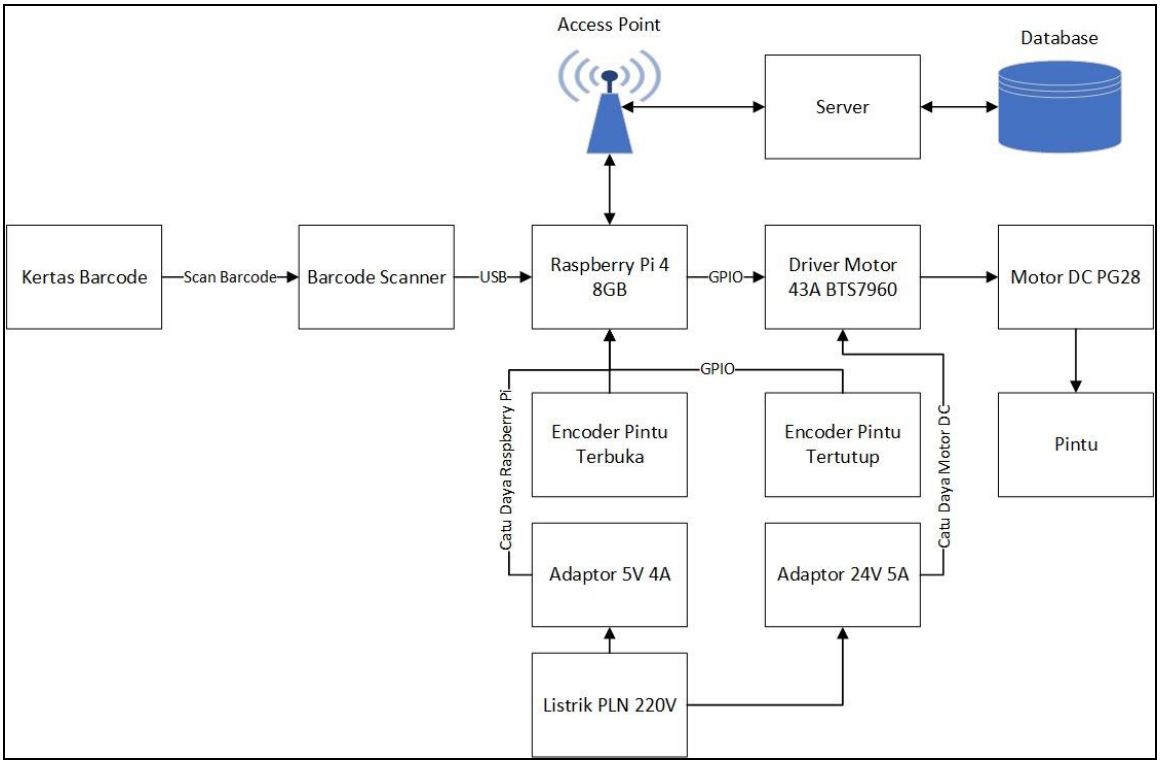


Figure 6. Electrical system block diagram

Components used in smart gate:

1. GM65 Barcode USB2.0 / UART

Figure 7. GM65 Barcode USB 2.0/UART

QR Code Barcode 2D 1D scanner for Raspberry Arduino Android Computer Output USB Serial TTL 5V

2. Raspberry Pi 4 8GB

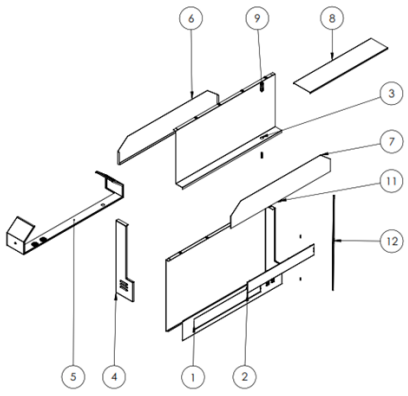
Figure 8. Raspberry Pi 4 8GB

3. Driver Motor and Motor DC

Figure 9. Driver Motor 43A BTS7960 IBT2 and Motor DC PG 28 + Encoder 7ppr

2. 3. Smart gate detailed

From the results of the design that has been done, then detailed drawings will be presented so that smartgates can be manufactured and mass-produced. The detailed images of the smartgate are shown in Figure 10:



Part Number	Description	Qty
1	Main part	1
2	Bottom cover	1
3	Cover part 2	1
4	Back cover part 3	1
5	Top cover	1
6	Top cover right side	1
7	Top cover left side	1
8	Top lid	1
9	Place of motor DC PG 28	1
11	Part of gate	1
12	Acrylic door	1

Figure. 10 Smart gate Body Details

4. CONCLUSIONS

The results obtained from this study are automatic gate designs that work on web and android based. The smart gate that is connected to the ticketing system is expected to be able to reduce human work at the pioneer port. If previously there were ticketing officers, entrance gates and ticket checkers for passenger departures, with this smart gate passengers simply scan the qr code so that the time required for check-in is shorter.

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